Notes on the Deep Water Calliostomas of the Panamic Province with Descriptions of Six New Species

BY

JAMES H. McLEAN

Los Angeles County Museum of Natural History
900 Exposition Boulevard, Los Angeles, California 90007

(Plate 62)

The Panamic species of the trochid genus *Calliostoma* may be grouped by depth of occurrence: one group of species occurs at low tide in rocky sublittoral zones, and on shallow offshore bottoms to depths of 20 fathoms, while another group of species is dredged only at depths of 30 fathoms and deeper. Only 2 deep water species have previously been known in the Panamic province. A third species known from the Peruvian province is added to the list and 6 new species are here described, based on a relatively small amount of material. In comparison to the numerous species of *Calliostoma* in the tropical western Atlantic (Clench & Turner, 1960), the number of species in the eastern Pacific is relatively sparse. The comparative lack of extensive deep dredging in the eastern Pacific may account for the paucity of known species. A more nearly equivalent number of species may eventually be known.

Sources of the new species described herein are as follows: The Templeton Crocker Expedition of 1936 produced one of the species. Three result from the Allan Hancock Pacific Expeditions and are part of the Allan Hancock Pacific Foundation Collection, now on loan to the Los Angeles County Museum of Natural History. Two result from recent dredging at Santa Cruz Island, Galápagos Islands, by André and Jacqueline DeRoy, the original specimens of which were kindly forwarded to me by Mr. Anthony D'Attilio of the San Diego Natural History Museum. I am grateful to the institutions and collectors mentioned for the opportunity to work with this material.

Abbreviations for institutions cited in the text are as follows:

AHF	Allan Hancock Foundation (collection on loan to LACM)
CAS	California Academy of Sciences, San Francisco
LACM	Los Angeles County Museum of Natural History
SDNHM	San Diego Natural History Museum
SSB	S. Stillman Berry Collection, Redlands, California
SU	Stanford University Collection, Stanford, California
USNM	United States National Museum

No attempt has been made at this time to assign any of the eastern Pacific species of *Calliostoma* to subgenera. Clench & Turner (1960) recognized three subgeneric groups based on radular and jaw morphology. In establishing new subgeneric taxa they failed to consider other generic units in the subfamily Calliostomatinae, many of which have been used in a full generic sense by workers in other parts of the world. My own radular studies on the easern Pacific species are in progress.

Three of the 8 species treated here are recorded from San Jaime Bank off Cape San Lucas and a 4th from the Gorda Banks in the same vicinity. Further dredging at these banks should prove productive.

Calliostoma iridium Dall, 1896

(Plate 62, Figure 1)

Calliostoma iridium Dall, 1896, p. 7; – 1902 p. 552, plt. 39, fig. 3; – 1908, p. 348, plt. 19, fig. 5

Diagnosis: Whorls flat sided, spiral cording consisting of 2 strong, beaded cords at the periphery and one below the suture, the area between these nearly smooth on the early whorls but with 7 finely beaded cords increasing in prominence on later whorls; base imperforate, sculptured with numerous, weakly beaded spiral threads. Color, yellowish pink with radiating flammules, with bronze pink irides-

cence strongest on the early whorls. Height, 21.5, diameter, 19.2 mm (holotype).

Type Material: Holotype, USNM 122957; 7 paratypes, USNM 122957a; 1 paratype, SSB 16962. Type locality: USFC station 3387, Gulf of Panama, 127 fms.

Distribution: Gulf of Panama. In addition to the type lot consisting of 9 specimens, there is 1 specimen, USNM 122956, USFC sta. 3391, Gulf of Panama, 153 fms.

Discussion: *Calliostoma iridium* may be distinguished from other eastern Pacific species by the near absence of sculpture between the subsutural and the 2 peripheral cords on the early whorls.

Calliostoma nepheloide DALL, 1913

(Plate 62, Figures 2 to 5)

Calliostoma nepheloide DALL, 1913, p. 592; – 1925, p. 9, plt. 24, figs. 2 - 3; – KEEN, 1958, p. 256, fig. 46 (upper figure only, copy DALL); – PARKER, 1964, p. 151

Diagnosis: Whorls flat sided, final whorl slightly convex, spiral cording consisting of a strong, projecting, beaded peripheral cord and about 12 fine beaded cords between it and the suture on the final whorl. Base imperforate, defined by a broad, unbeaded cord below the peripheral cord, base with about 18 weakly beaded cords, more broadly spaced near the columella. Color, olive green with darker flammules, basal cords with alternating light and dark markings. Height, 25, diameter, 22 mm (holotype).

Type Material: Holotype, USNM 96637. Type locality: USFC sta. 2804, Panama Bay, 47 fms. The holotype has the lip broken back about $\frac{1}{3}$ of a whorl. DALL's 1925 illustration reconstructed the position of the lip.

Distribution: Point Abreojos to Cape San Lucas, Baja California; Mazatlan, Sinaloa, Mexico to Gulf of Panama. Records: AHF 1711-49, 30 mi. S. Pt. Abreojos, Baja California, 52 fms.; AHF 618-37, San Jaime Bank, off Cape San Lucas, 75 fms. (Plate 62, Figure 5); off Mazatlan, Sinaloa, Mexico, 88 - 92 fms. (PARKER, 1964); AHF 273-34, Tenacatita Bay, Jalisco, Mexico, 45 fms.; SDN HM 39799, off Manzanillo, Colima, Mexico, 52 fms. (Plate 62, Figures 3, 4); LACM, Gulf of Tehuantepec, Chiapas, Mexico, leg. D. Shasky, 45 fms.; CAS 17986, Gulf of Chirqui, Panama, 35 - 40 fms. The species is as yet unknown from the Gulf of California.

Remarks: The 2 immature specimens from San Jaime Bank off Cape San Lucas differ from the others in having the immediate subsutural cord more strongly beaded than the others. This is the only significant feature of variation in the material examined. The olive coloration of the species is distinctive.

Calliostoma fonkii (PHILIPPI, 1860)

(Plate 62, Figures 6, 7)

Trochus fonkii PHILIPPI, 1860, p. 185, plt. 7, fig. 22
Calliostoma fonkii (PHIL.) – PILSBRY, 1889, vol. 11, p. 371, plt. 57, fig. 48 (copy PHILIPPI). – DALL, 1909, p. 240.

Diagnosis: Whorls flat sided, final whorl slightly convex; spiral cording consisting of a smooth peripheral cord, the lower part of which is covered by succeeding whorls, and 3 prominent cords per whorl, the 2 uppermost coarsely beaded, narrow raised ridges between major cords appearing on the final whorls; base imperforate, with up to 11 evenly spaced unbeaded cords. Color tan, with darker cording. Height, 17.5, diameter, 16.2 mm (AHF 802-38).

Type Material: Holotype, not located. Type locality uncertain: "Between Chiloë and the mainland of Peru" (PILSBRY, 1889).

Distribution: Galápagos Islands; Peru south to Chiloé Island, Chile (43° S). Records: AHF 802-38, NW of Charles (Santa Maria) Island, Galápagos Islands, Ecuador (1°09′ S, 90°35′ W), 250 fms. (Plate 62, Figure 6); AHF 371-35, Independencia Bay, Peru (14°15′ S), 5 fms. (Plate 62, Figure 7). The two specimens here reported are believed to be the first specimens known since the original description.

Remarks: Although the 2 specimens are from widely separated localities and vastly different depths, no essential points of difference are apparent. The Galapagan specimen is colorless and the nacre is slightly leached, while the smaller Peruvian specimen was live-taken and is tan with brownish ribs.

Little can be said of the distribution and occurrence of this species until more material is known. It may perhaps not be a characteristically deep water species, judging at least from its shallow occurrence in Peru.

Calliostoma gordanum McLEAN, spec. nov.

(Plate 62, Figures 8 to 10)

"*Calliostoma nepheloide* DALL." – KEEN, 1958, fig. 46 (lower figure only).

Diagnosis: Whorls slightly convex, spiral cording con-

sisting of 2 peripheral cords with a finer intercalary cord between; 7 - 8 strong beaded cords between sutures on final whorl, secondary threading between cords on final whorl; base imperforate, with 17 - 20 beaded cords. Color whitish, with radiating light tan maculations, base unmarked. Height, 19.6, diameter, 20.0 mm (holotype).

Description of Holotype: Shell of moderate size for the genus, light, rather fragile. Postnuclear whorls 7, slightly convex. Periphery rounded but defined by 2 somewhat stronger spiral cords with a finer intercalary cord between. Fifth postnuclear whorl with a strongly beaded subsutural cord and 6 thin, raised, unbeaded cords between it and the upper peripheral cord. By the 5th whorl the intermediate cords are finely beaded and fine intercalary threads have appeared. By the 7th and final whorl the intercalary threads have increased in size and are beaded as are the primary cords. Base imperforate with 17 cords, intercalary threads between the outermost cords, those nearer the columella more broadly spaced and beaded in a radiating pattern. Color whitish tan with brownish flammules, aperture iridescent with pink and green, base unmarked.

Type Material: Holotype, CAS 13271; 3 paratypes, CAS 13272; 1 paratype, LACM 1268; 1 paratype, USNM 679551; 3 paratypes, SDNHM 40041; 1 paratype, SU 9985. Type locality: Gorda Banks, off southeastern Baja California, CAS locality 17752. According to Dr. Leo G. Hertlein, this station represented 26 hauls made by Crocker and Beebe on the Templeton Crocker Expedition of 1936 in the vicinity of the Gorda Banks, approximately 23°02′ N, 109°31′ W, probable depth, 70 fms. Seven specimens, originally identified by A. M. Strong as *Calliostoma nepheloide,* were in this lot. Three additional specimens, evidently from the same lot, were found in the Strong collection at the San Diego Museum.

Referred Material: One additional lot is known: AHF 531-36, San Francisquito Bay, Baja California (28°26′ N, 112°53′30″ W), 10 fms., 2 specimens (Plate 62, Figure 10). The illustrated specimen from this lot is 13 mm in height and has slightly more prominent spiral cording but is otherwise typical. The relatively shallow depth record of 10 fathoms for this lot may be anomalous. Dredging off the tip of Baja California should produce additional material of this species.

Discussion: *Calliostoma gordanum* may be separated from *C. nepheloide* by its light color, its near absence of spiral markings on the basal cords, and in having 2 rather than 1 major peripheral cords.

Calliostoma sanjaimense McLean, spec. nov.

(Plate 62, Figure 11)

Diagnosis: Whorls flat sided, spiral cording consisting of 2 strong, beaded peripheral cords, a strong subsutural cord, and 5 strongly beaded intermediate cords; base imperforate, with 11 broad, nearly smooth spiral cords. Color yellow brown with light and darker markings particularly on the peripheral cords. Height, 20.0, diameter, 18.4 mm (holotype).

Description of Holotype: Shell of moderate size, sturdy, flat sided. Postnuclear whorls 7. Periphery angulate, defined by 2 prominent beaded cords with a narrow intercalary cord between. A strong, beaded subsutural cord is prominent on later whorls. On the 3rd whorl there are 3 cords of equal strength; other cords arise as intercalary threads that eventually become beaded and assume full size, until in the final whorl there are 5 beaded cords and 4 intercalary threads between the subsutural and the uppermost peripheral cord. Base imperforate, with 17 broad, low cords, interspaces of nearly equal width, the 3 cords close to the columella faintly beaded. Color yellow brown with light and darker maculations especially on the peripheral cords.

Type Material: Holotype, LACM-AHF 1269; 2 paratypes, LACM-AHF 1270, 1 paratype, USNM 679552.

Type Locality: San Jaime Bank, west of Cape San Lucas, Baja California, Mexico, 22°50′30″ N, 110°15′ W, 75 fms., *Velero III* station 618-37, 3 March 1937. The 3 paratypes are all immature, the largest specimen measuring 10.3 mm in height. No additional material is known.

Discussion: *Calliostoma sanjaimense* is most closely related to *C. iridium* but has a sturdier shell, has strongly beaded cords on the early whorls, which are lacking in *C. iridium,* and has fewer and more prominent basal cords. The immature paratype specimens show brilliant metallic iridescence of green and yellow on the smooth narrow interspaces between the spiral cords of the early whorls, but this luster has evidently faded in the holotype.

Calliostoma veleroae McLean, spec. nov.

(Plate 62, Figure 12)

Diagnosis: Whorls concave, spiral cording consisting of a projecting peripheral cord and 6 evenly beaded cords on the last whorl; base imperforate, but with a shallow depression, base with about 18 low cords, beaded near the columella. Color yellowish with brown flammules, basal

cords with alternating light and dark markings. Height, 15.9, diameter, 17.0 mm (holotype).

Description: Shell of moderate size, sturdy, sides of whorls concave, imparting a concave slope to the sides of the shell. Postnuclear whorls 8, periphery sharply angulate, projecting, actually composed of 3 finely beaded cords, 2 at the edge of the periphery and 1 just above. Strong subsutural cord lacking. There are 3 beaded intermediate cords on the 3rd whorl, increasing by the addition of intercalary threads that gradually increase in size and become beaded until there are 6 cords and an equal number of intercalary threads on the final whorl. Base slightly convex, imperforate but with a hollow excavation near the columella; base with 18 low spiral cords, the interspaces of nearly equal width; innermost cords faintly beaded in a radial pattern of growth. Color yellowish with brown flammules, basal cords with alternating light and dark markings.

Type Material: Holotype, LACM-AHF 1271.

Type Locality: Three miles south of Isla Ladrones, Panama, 7°49′ N, 82°23′30″ W, 54 fms., *Velero III* station 943-39, 27 March 1939. The holotype, the only known specimen, has a broken lip and a hole in the base of the shell; the color is evidently somewhat faded.

Discussion: *Calliostoma veleroae* stands alone among west American species in having a concave outline and a sharply carinate periphery. It also differs from most of the species discussed here in lacking a relatively strong subsutural cord. A species of somewhat similar proportions in the Caribbean fauna is *Calliostoma aurora* Dall, 1888, but that species has a smooth, nearly concave base.

Calliostoma veleroae is named in honor of the *Velero III*, the vessel of the late Captain G. Allan Hancock, whose collecting expeditions formed the basis of the rich molluscan material in the Allan Hancock Foundation collection.

Calliostoma keenae McLean, spec. nov.

(Plate 62, Figures 13 to 16)

Diagnosis: Whorls and periphery rounded, spiral cording unbeaded until the 4th whorl, final whorl with numerous raised, finely beaded spiral cords, interspaces of equal width; base imperforate, with about 12 low, weakly beaded cords. Color, drab green or yellow brown with brown flammules. Height, 14.9, diameter, 15.5 mm (holotype).

Description of Holotype: Shell of medium size, whorls markedly convex, base of shell delimited by a thicker spiral rib, postnuclear whorls 7. Sculpture of first to 3rd postnuclear whorls consisting of 3 raised cords, a trace of beading appearing on the uppermost cord on the 4th whorl; the middle of the 3 original cords persists as a slightly more prominent cord on all succeeding whorls. Additional cords arise from intercalary threads until, on the final whorl, there are 15 cords between the basal cord and the suture; interspaces are about as wide as the cords and the uppermost cords are the more strongly

Explanation of Plate 62

Figure 1: *Calliostoma iridium* Dall, 1896. Holotype, USNM 122957. Gulf of Panama. Height, 21.5, diameter, 19.2 mm. × 1.5

Figure 2: *Calliostoma nepheloide* Dall, 1913. Holotype, USNM 96637. Panama Bay. Height, 25, diameter, 22 mm. × 1.5

Figures 3 and 4: *Calliostoma nepheloide*. SDNHM 39799. Manzanillo, Mexico. Height, 20, diameter, 20 mm. × 1.5

Figure 5: *Calliostoma nepheloide*. AHF 618-37. San Jaime Bank, Mexico. Height, 11.7, diameter, 11.6 mm. × 1.5

Figure 6: *Calliostoma fonkii* (Philippi, 1860). AHF 802-38. Charles Island, Galápagos. Height, 17.5, diameter, 16.2 mm × 2

Figure 7: *Calliostoma fonkii*. AHF 371-35. Independencia Bay, Peru. Height, 9.1, diameter, 8.0 mm. × 4

Figures 8 and 9: *Calliostoma gordanum* McLean, spec. nov. Holotype, CAS 13271. Gorda Banks, Mexico. Height, 19.6, diameter, 20.0 mm. × 1.5

Figure 10: *Calliostoma gordanum*. AHF 531-36. San Francisquito Bay, Mexico. Height, 13.2, diameter, 13.3 mm. × 1.5

Figure 11: *Calliostoma sanjaimense* McLean, spec. nov. Holotype, LACM-AHF 1269. San Jaime Bank, Mexico. Height, 20.0, diameter, 18.4 mm. × 2

Figure 12: *Calliostoma veleroae* McLean, spec. nov. Holotype, LACM-AHF1271. Isla Ladrones, Panama. Height, 15.9, diameter, 17.0 mm. × 2

Figures 13 and 14: *Calliostoma keenae* McLean, spec. nov. Holotype, LACM-AHF 1272. Off Laguna Beach, California. Height, 14.9, diameter. 15.5 mm. × 3

Figure 15: *Calliostoma keenae*. AHF 618-37. San Jaime Bank, Mexico. Height, 8.7, diameter, 8.9 mm. × 3

Figure 16: *Calliostoma keenae*. AHF 921-39. Clarion Island, Mexico. Height, 10.5, diameter, 10.1 mm. × 3

Figure 17: *Calliostoma jacquelinae* McLean, spec. nov. Holotype, SDNHM 51299. Santa Cruz Island, Galápagos. Height, 11.3, diameter, 10.0 mm. × 3

Figures 18 and 19: *Calliostoma santacruzanum* McLean, spec. nov. Holotype, SDNHM 51301. Santa Cruz Island, Galápagos. Height, 7.0, diameter, 6.9 mm. × 5

Figure 1

Figure 2

Figure 3

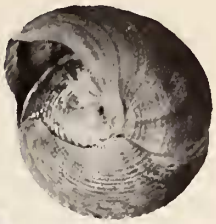

Figure 4

Figure 5

Figure 6

Figure 7

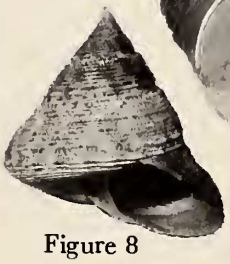

Figure 8

Figure 9

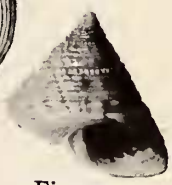

Figure 10

Figure 11

Figure 12

Figure 13

Figure 14

Figure 15

Figure 16

Figure 17

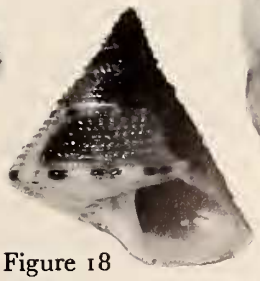

Figure 18

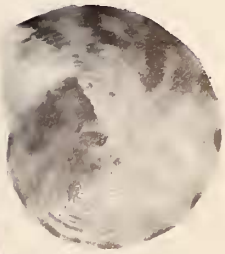

Figure 19